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Prize for a Faculty Member for Research in an Undergraduate Institution Talk: The Rewards of Research at an Undergraduate Institution and Lessons Learned in Building Detector Systems that Work[1]

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This talk addresses primary lessons learned during 28 years of work leading to the awarding of this prize for work on designing, building and operating detectors, with most of the work involving over 150 undergraduates during this time period. There are a wide range of skills and knowledge to be learned if a young scientist is interested in following this career route, so the most important subset of these will be described. Part will be how to involve undergraduate students at their fullest potential, and important differences of ACU from many programs, which has led to collaborators to make inquiries as to when will the "ACU Army" arrive so that they can time when their detector components will be shipped to the experiments for the testing and setup to be handed over to these students. The size of the detectors constructed have varied from small hodoscopes to the world's largest active cathode strip chambers. The science knowledge needed for detector construction is extremely multidisciplinary, and this must be learned by the professor directing the work as they will not have an engineering or support staff to lean on usually. This will include fields often considered unimportant to physics; however, ignorance of them can lead to failure. Knowing the primary question to ask will show where a significant area of concern will lie in what is being done by a person, group or company on a subsystem for a detector. Textbook descriptions of detectors, electronics, and materials can lead young experimenters astray. It has been learning the correct, fundamental physical processes that determine actual detector performance that has allowed the awardee to make his most important contributions over many years of research. A final lesson to be described will be how to make your undergraduate research program self-sustaining, so that critical knowledge is not lost as students graduate.

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